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ABSTRACT

This teacher's resource guide contains a number of activities for use primarily in kindergarten through third grade. Twenty-four classroom activities are described, most of which involve observing and discussing various kinds of sea life found at the seashore. Background information is provided in the guide so that the teacher can use this unit without requiring many outside resources. Suggestions for organizing a field trip to the seashore and for creating a "seashore atmosphere" in the classroom are included, as is a list of equipment and supplies needed for the activities. (PR)

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INTERDISCIPLINARY OUTDOOR EDUCATION

Sea And Shore

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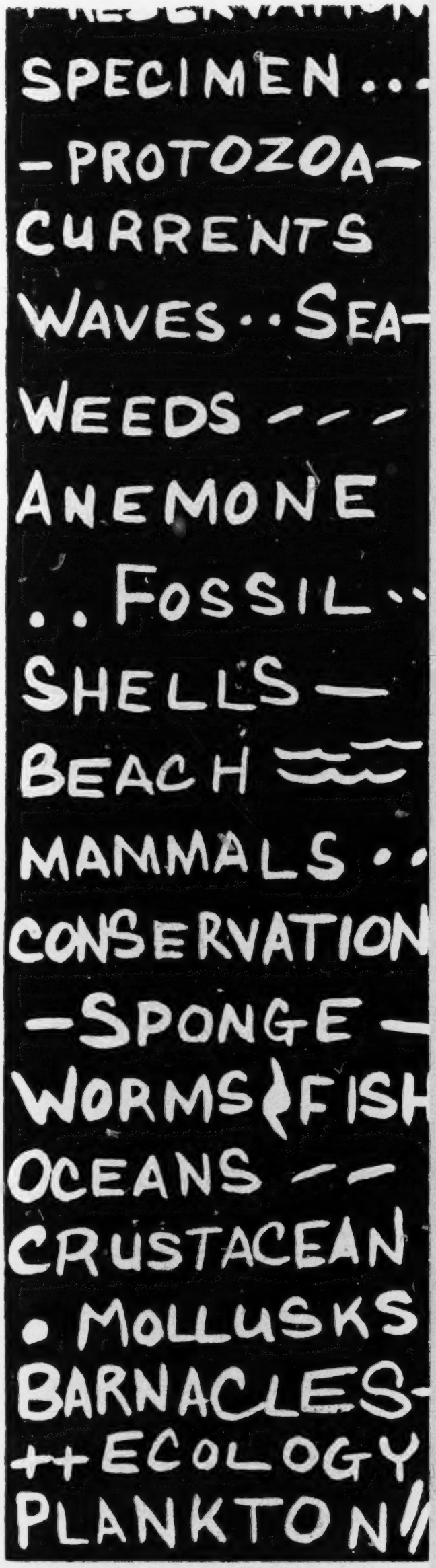


INTRODUCTION

In response to requests of many elementary teachers for resource guides to aid them in the use of the out-of-doors to enhance their teaching, the Outdoor Education Program has obtained the services of four excellent primary teachers to develop units for the primary level. Units are being developed for the school grounds, the forest or woods, and this unit, the "Sea and Shore".

The seashore is a unit of study that can be successfully started in Kindergarten and continued through the elementary grades. We have compiled and written a resource unit on the "Sea and Shore" for use primarily in Kindergarten - Third grade. (Fourth grade teachers might also find this useful in teaching an "Oceanography" unit.) We have attempted to give enough background information so that the teacher is able to use this unit without going to many outside resources.

We feel that you as teachers can be our best critics. As you use this guide, please note which activities were successful for you and which ones failed. We would also appreciate any other suggestions you might have to make this unit more valuable to the classroom teacher. There are plans to revise the unit at the end of the school year, so your suggestions can be included in the final publication.

Thank you,

Karren Richeson - Ridgecrest
Janey Knaack - North City

SEA AND SHORE

I. ANIMAL LIFE OF THE SEA

A. INVERTEBRATES - Animals Without Backbones

1. Primitive Sea Animals
   a. Protozoa - one-celled animals
   b. Porifera - sponges
   c. Coelenterates - jellyfish, corals, sea anemones

2. Worms
   a. Flatworms - ribbon worm
   b. Segmented Worms - clam worm

3. Anthropods - Crustaceans - Animals With Jointed Legs
   a. Crabs
   b. Shrimp and prawns
   c. Lobsters
   d. Beach fleas
   e. Barnacles

4. Echinoderms - Spiny-Skinned Animals
   a. Starfish
   b. Sea Urchins
   c. Sea Cucumber
   d. Sand Dollar

5. Mollusks - Soft-bodied animals in shells
   a. Bivalve shelled animals
   b. Univalve shelled animals
   c. Squids and Octopuses

B. VERTEBRATES - Animals With Backbones

1. Fish

2. Birds

3. Mammals

4. Reptiles

II. PLANT LIFE OF THE SEA

A. PLANKTON - Basic food supply of the sea

B. ALGAE - Seaweeds and kelps

1. Green Algae
2. Brown Algae
3. Red Algae

III. ECOLOGY - Relationship between plants, animals and their environment

A. CYCLES - Chains of Events

1. Life Cycles

2. Food Chains and Webs

3. Oxygen - Carbon Dioxide

B. ADAPTATION TO LIVING IN THE SEA

1. Salt Water vs. Fresh Water

2. Effects of Water on Body Structure

3. Role of Tides in Food Gathering

C. COOPERATION BETWEEN ANIMALS

1. Food Gathering

2. Camouflage

3. "Housing"

IV. MOVEMENTS OF THE SEA

A. TIDES - Gravitational pull of sun and moon

B. WAVES

1. Wind as major cause

2. Effects on topography of seashore

C. CURRENTS (Their causes and effects)

V. LIFE IN THE SEA LONG AGO

A. FOSSILS - Record of how life began

B. SEA AS THE CRADLE OF ALL LIFE

1. One-celled animals

2. Invertebrates
   a. Sponges, Jellyfish, Worms
   b. Mollusks
   c. Trilobites

C. AMPHIBIANS

D. REPTILES - Sea, Land, and Air

VI. NATURE OF THE SEA - Physical and Chemical Composition

A. WHY THE SEA IS SALTY

1. Sources of salt and other minerals

2. Effects of evaporation

B. BEACHES - Sandy, Muddy, Rocky

VIII. CONSERVATION OF THE SEA

A. THE "NEW FRONTIER"

1. Exploration and mapping

2. Underwater exploring equipment

3. Man and life under the sea

B. SOURCE OF WEALTH AND LIFE

1. Minerals

2. Food and Water

3. Uses for transportation and industry

4. Source of pleasure - sports and recreation

C. MAINTAINING BALANCE OF NATURE

1. Conservation of animals

2. Conservation of plants

I. ANIMAL LIFE OF THE SEA

A. INVERTEBRATES ARE ANIMALS WITHOUT BACKBONES.

1. The structure of primitive sea animals has gone unchanged for billions of years.
   a. Protozoa are one-celled animals.
   b. Porifera are the first of the many-celled animals.
   c. The Coelenterate body has a simple digestive system consisting of a mouth and a short tube-like gullet.

2. Worms are longer than they are wide; they have soft bodies and no skeletons.
   a. A ribbon worm is an example of a flatworm.
   b. A clam worm is an example of a segmented worm.

3. Crustaceans are Anthropods with jointed legs.
   a. Crustaceans, such as crabs, shrimps, and prawns, have bodies in three segments, four or more pairs of legs, and chitinous exoskeletons covering all body parts.
   b. Barnacles are classified as Crustaceans because in their infancy they resemble the sand flea.
   c. Many Crustaceans are eaten by man.

4. Echinoderms move by means of tube feet and have spiny skins.
   a. Starfish have powerful rays with which they pry apart and eat many other animals.
   b. The sea urchin is portected by the spines that cover his entire body.
   c. When attached, the sea cucumber eviscerates; while predator is eating, he swims off and grows a new set of intestines.
   d. Sand dollars derive their name from their unique shape.

5. Mollusks are animals whose soft bodies are encased in shells.
   a. Bivalve (clams and oysters) shells consist of two parts held together by a strong adductor muscle and a hinge on one side.
   b. Univalves (snails and limpets) have one shell; when frightened they pull their entire body into their shell and close it off with a operculum (trap door).
   c. Squids and octopuses are also Mollusks.

B. VERTEBRATES ARE ANIMALS WITH BACKBONES.

1. There are more than 14,000 different species of fish.

2. The beaks and claws of sea birds are especially adapted for fishing, wadding, and swimming.

3. While some mammals and reptiles are adapted for living in the sea, they breathe with lungs as man does.

II. PLANT LIFE OF THE SEA

A. PLANKTON IS THE BASIC FOOD SUPPLY OF THE SEA.

1. Plankton consist of microscopic plants called photoplankton.

2. Animal plankton are called zooplankton.

B. ALL SEA PLANTS (Seaweeds and kelps) OTHER THAN PLANKTON ARE CALLED ALGAE; THEY ARE CLASSIFIED BY COLOR.

1. Green algae are found nearest the surface of the water.

2. Brown algae grows in deeper waters and is sometimes exposed by low tides.

3. Red algae grows in depths where little light penetrates.

III. ECOLOGY - Relationship between plants, animals and their environment

A. CYCLES ARE CONTINUOUS CHAINS OF EVENTS, RECURRING REGULARLY AND IN A SET SEQUENCE.

1. Animals' life cycles consist of birth, growth, spawning and death.

2. All sea food chains begin with the sun and plankton and end with the last predator - sometimes man.

3. Plants and animals exchange carbon dioxide and oxygen.

B. SEA ANIMALS HAVE MADE SPECIAL ADAPTATIONS TO SURVIVE THE DENSITY AND SALINITY OF THEIR ENVIRONMENT.

1. Salt water is subjected to more changes - temperature, salinity, movements - than is fresh water.

2. Moving salt water provides the circulatory system for many simple sea animals.

3. Ebb and flow of the tides brings food to many stationary sea animals.

C. MANY SEA ANIMALS COOPERATE IN FOOD GATHERING, PROTECTIVE CAMOUFLAGE, AND "HOUSING".

SCOPE AND SEQUENCE CHART

Grade	Animal Life of the Sea	Plant Life of the Sea	Ecology	Movements of the Sea
K	Animals without backbones: sponge, jointed-legged, spiny skinned, bivalves, univalves. Animals with backbones: fish, birds, mammals of the sea	Color classification of algae: green, brown, red	Simple food chain Needs of animals and plants in salt water	Tides - simple definition Waves - Their causes
1	Animals without backbones: Review of K materials, adding grouping into families Animals with backbones: Family characteristics of fish, birds, and mammals	Plankton - basic food supply of the sea Algae - seaweeds and kelps (depth determines color)	Animal cycles Food Chain Problems of animals living in sea water	Tides - relationship between sun, moon and earth Waves - their causes and effects Currents
2	Invertebrates: primitive sea animals one to many celled, worms, simple classification according to body structure Vertebrates: fish, birds, reptiles, and mammals	Plankton - drifts with tides, contains microscopic animals and plants. Algae - simple classification, according to color & structure.	Food chains Adaptation of animals & plants to salt water Salt water vs. fresh Life cycles Role of tides Cooperation between animals(example -crab and barnacle)	Tides - introduce "gravitational pull" and beach zones Waves - causes and effect on topography Currents - reivers in the sea
3	Invertebrates: Terms - protozoa, porifera, Coelenterate, Worms Crustaceans, Mollusks Characteristics of each group of sea animals	Plankton - distinguish between photo and zooplankton; give examples of each Algae: Structure of seaweed Effects of water depth and sunlight on structure and color	Ecology - definition of term Life cycles - food chains food webs, oxygen--CO_2 Effects of water on body structure Interdependence of animals	Tides - causes and effect on sea life Beach Zones - characteristics Waves - tidal wave Currents - causes and effects

Grade	Life in the Sea Long Ago	Nature of the Sea	Conservation of the Sea
K	Fossils - record of life long ago Dinosaurs - relative of the sea turtle	Sea is salty - salt from soil Three kinds of beaches	Exploring the sea - equipment and dangers Sea food Recreation Transportation "Care of the beach"
1	Fossils - what they tell us First animals lived in the sea Dinosaurs - land and sea	Sea contains salt and other minerals Three kinds of beaches	Exploring the sea - purpose Source of food Sea Industries - fishing Water sports "Care of the seashore"
2	Fossils - how they were made Order of animal appearance - seaplants and animals first Dinosaurs - land, sea, and air	Evaporation - effect on saltiness of sea Three beach types - "rocky" most interesting	Exploring the sea - needs of man living under the sea Source of food, water and minerals Water transportation "Conservation"
3	Fossils - fossil record of earth different eras of earth Sea as cradle of life: evolution of plants and animals Amphibians - link between sea and land Dinosaurs - Age of Reptiles	Mineral content of sea Term - salinity Causes of salinity - minerals from land and evaporation Three beach types and animals and plant specimens of each	Exploration and mapping Term - "oceanography" Equipment for exploration Minerals, food, and water Sea routes and industry Balance of nature - pollution

TAKING A FIELD TRIP TO THE BEACH

PRE-PLANNING:

1. The children should be given enough background regarding animal and plant life of the sea to enable them to recognize specimens.

2. Usi ng a tide table, plan with the children a good time and date (Preferrably at "low tide") for your trip.

3. Make a list of things children should look for (see list following) and go over it with them to be sure they know about where they might locate each item.

4. Arrange through your district for the trip, including location, bus, guide, etc.

5. Notify parents as to clothing and equipment (pai ls, spades or spoons, plastic bags) needed for the trip. (Be sure to include rubber boots!)

6. Obtain four or five parents as chaperones. Meet with them sometime before the trip and explain to them their duties. Go over the list of things they're looking for so they can help the children find them.

ORGANIZATION:

1. Discuss with the children the behavior expected of them both on the bus and at the beach. Set a signal (perhaps a whistle) that means "stop at once and gat her around me". This will enable you to "share" any exciting specimens you might find.

2. Discuss conservation with the children. Read them the "Shell Collector's Creed", Activity #47. Discuss how greed might be harmful to the ecology of the beach, and limit the number of specimens each child might bring back with him.

3. Take care of bathroom needs before leaving.

4. Divide children into four or five groups with one parent per group. Leave yourself free to move from group to group, and point out interesting items.

5. Each parent will be given a list of things to find. As the children locate each item, they will show it to their leader who will point it out to the group and then check it off.

AT THE BEACH:

1. Leave the bus by groups.

2. Collect specimens and locate and observe the tiems on the lists.

3. Gather together for a brief sharing period.

4. Allow the children a few minutes of free time. (The braver teacher may wish to have children bring their lunches and eat at the beach.)

5. Load the bus and return home. Gather all specimens into one box or pail and put one adult in charge of them.

FOLLOW-UP:

1. Share your experiences and findings.

2. Write a story or poem about the trip.

3. Write thank-you notes to parent chaperones.

4. Press algae and preserve specimens. (see activities 2 and 27)

5. Classify and name specimens.

6. Make a beach scene (see activity 34) with specimens.

7. Begin the formal activities on the seashore. The trip should provide good motivation and much background information.

8. Encourage children to visit the beach with their families or friends

Suggested List of items to be observed at the seashore:

1. Taste sea water
2. Identify type of beach
3. Locate the high tide mark
4. Sea anemone
5. Jellyfish
6. Worms
7. Crab
8. Beach fleas
9. Barnacles
10. Starfish
11. Sea urchin
12. Sand Dollar
13. Live mollusks - snail and clam
14. Mollusk shells

15. Sea birds
16. Algae - green, red and brown
17. Hermit crab
18. An example of camouflage
19. Place where waves have worn away or smoothed cliffs, rocks, or wood.

(if some of these items cannot be located, discuss with the children why they did not find them.)

PREPARING YOUR ROOM
TO TEACH THE SEASHORE

In some cases it will not be possible to take your class on a visit to the seashore. You can, however, create a "seashore atmosphere" in the classroom. The following suggestions might help you to do this.

1. Set aside a place--a shelf, table, or a windowsill--for the children to display shells and other floatsom and jetsom they've collected at the seashore.

2. Make a seashore diorama (see activity 34).

3. Prepare a bulletin board for displaying information about the seashore.

4. Set up a library table with a good collection of books on the seashore (see bibliography).

5. Prepare a vocabulary chart and add words to it as they come up in your study (the words might also be used for spelling and phonics games.).

6. Add one or two spelling words related to the seashore to the weekly spelling lists of second or third graders.

7. Set aside the first few minutes of one morning each week for "seashore sharing". Encourage children to bring specimens, current events, magazine articles, or share stories, poems, or personal experiences related to the sea and marine life. These might be displayed or compiled into a class scrapbook.

8. Have children make booklets about the sea and shore. You might wish to order the entire children's booklet found on pages 1 to 53 . This should be ordered from the IMC through Mr. Neal. You may wish to have the children make covers, and then hand out the booklet pages a few at a time as each concept is studied and discussed. The final booklet can then be stapled or bound and sent home.

9. Write poems or stories about the sea.

10. Third graders may be assigned reports on various seashore animals. These could be presented as each class of animals is studied.

11. Make and hang "fish mobiles" from the lights and put some tissue-paper fish and sea creatures on your windows.

SCIENCE EQUIPMENT AND SUPPLIES

SEA ANIMALS:	**Live Specimens**	**Preserved Specimens**
	Crab	Crab
	Sea Anemone	Sponge
	Starfish	Starfish
	Sea Urchin	Sea Urchin
	Sea Cucumber	Sea Cucumber
	Sand Dollar	Sand Dollar
	Oyster	Oyster
	Clam	Coral
	Snail	
	Fish	
	Turtles	
SHELLS:		
clam, limpet, oyster		
ALGAE:	Plankton	Green
		Red
		Brown
ENVIRONMENT MATERIALS:	Salt water	
	Sand, mud, rocks	
	Seafood	
SUPPLIES:	Balance scale	Milk cartons
	Bowl	Mineral oil
	Cardboard	Paper mache
	Cardboard boxes	Plaster of Paris
	Cheesecloth	Plastic spray
	Commercial sponge	Rope
	Copper sulfate crystals	Salt
	Disecting instruments	Screening wire
	Flannel board	Straws
	Flower pot	Trays
	Food coloring	Tweezers
	Glasses	Wash tub
	Globe	World map
	Knife	Microscope
	Magnifying glasses	Microprojector

ACTIVITIES

Activity # 1

CONCEPT:

The Sea

SUBCONCEPT:

The ocean is two-thirds of the earth's surface.

MATERIAL REQUIRED:

1. Globe
2. Small boat
3. World map

PRE-TRAINING AND BACKGROUND INFORMATION:

1. The ocean is a large part of the earth's surface.
2. The ocean is taking on increased importance as men look to it as a source of food and minerals for an expanding world population.
3. A new field called oceanography is studying the ocean's physical and biological environment.

ACTIVITY:

1. Place a globe on a ta ble in front of the class; allow one child to look for the end of the ocean. Discuss with the class if there is an end to this vast body of water.
2. Discuss what things are found in the ocean--plants, animals, and minerals. Discuss how the ocean can be useful to us.
3. Let the children discover how large the ocean is. Compare a world map with a globe. (Concept that a map is a flattened out picture of the globe.) Have the children locate parts of the globe on the map. Locate the United States.
4. Allow one child to try to find the end of the ocean by using the toy boat to sail around the world.

FOLLOW-UP:

1. Use the study prints SP E-66, "Sea Pictures", and SP E-26, "Deep Sea Life Pict ures" to illustrate the importance of the sea to man.
2. Discuss how the sea has been man's major highway; if this is changing; why?

Source: Science Far and Near Book #3

Activity # 2

CONCEPT:

Sea Life Preservation

SUBCONCEPT:

How to preserve specimens collected at the seashore.

MATERIALS REQUIRED:

1. Epsom salt
2. Water
3. Soda
4. Enamel container
5. Tweezers
6. Formaldehyde
7. Alcohol

PRE-TRAINING AND BACKGROUND INFORMATION:

1. This preservation process may be done in a class (grades 2-3) or the teacher may wish to do it outside the regular classroom situation.
2. After preservation, the sea life specimens may be used for numerous learning experiences and exhibitions in the classroom.

ACTIVITY:

1. Place specimen in Epsom salt solution.
2. Boil in water to which some soda has been added.
3. Remove soft parts with tweezers.
4. Soak in the Epsom salt solution for three days; dry in the sun.
5. Other sea animals can be best kept in a formaldehyde solution, (one part of formaldehyde to ten parts of water.)

FOLLOW-UP:

1. Children may want to collect one specimen for preserving--to be done at home.
2. Preserved specimens can be used in classification lessons, descriptive and creative writing, and discovery experiences through which they gain new facts about the specimen.

Source: Science Activities: for Elementary Children

Activity # 3

CONCEPT:

Animal Life - Primitive Sea Animals

SUBCONCEPT:

Protozoa are one-celled animals.

MATERIALS REQUIRED:

1. Commercially prepared slide of a Protozoa (slide #1)
2. Slide, slide cover, and eye dropper (slide #2)
3. Pond water
4. Microscope or microprojector

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Protozoa from salt water are difficult to obtain and preserve.
2. Use the protozoa (paramecium) as an example and relate this to the protozoa found in the sea.

ACTIVITY:

1. Collect a sample of water from a pond or aquarium.
2. Place a drop of the water on a slide, cover the slide, and examine under a microscope. (slide #2)
   A microprojector will allow the whole class to share in the activity.
3. Present both slides to the class; encourage children to discover and answer their own questions. Discuss: are the animals moving, what is the basic structure of the animals, how might these animals take in food?

FOLLOW-UP:

1. Provide a simple drawing of an example of a protozoa on the blackboard, chart form or a ditto.
2. Kindergarten - children encouraged to color the animal
   First grade - children may simply label the drawing
   Second grade - more details may be added
   Third grade - discussion of characteristics of respiration, locomotion, and nutrition may be encouraged
3. Bring in slides of other one-celled animals -- relate to concept that the "sea is the cradle of all life".

Source: Science In Our World Book #5

Activity # 4

CONCEPT:

Animal Life - Primitive Sea Animals

SUBCONCEPT:

Porifera are the first of the many-celled animals.

MATERIALS REQUIRED:

1. Natural sponges
2. Balance scale
3. Commercial sponges
4. Magnifying glass

PRE-TRAINING AND BACKGROUND INFORMATION:

1. The simplest of the many-celled animals is the phylum Porifera--an example is the sponge.
2. The bodies of the Porifera are covered with millions of tiny holes through which water flows and the tiny sea organisms are filtered out for food.

ACTIVITY: Demonstration:

1. Using a balance scale, weigh a natural sponge.
2. Saturate it with water and weigh it again.
3. Allow class to observe carefully and discuss: why is it possible for a sponge to hold so much water?
4. Examine the sponge with a magnifying glass; observe its porosity.
5. Repeat the preceding procedure using a commercial, "household" sponge. Compare findings between the two different sponges.
   Discuss: Which sponge absorbed the most water?
   Why do you think this was the finding?
   Are all commercial sponges identical in make-up?
   How might you find this out?

FOLLOW-UP:

1. Obtain the sponge collection available through the University of Washington - Traveling Collection.
2. Use sponge painting as an appropriate art project.
3. Carve sea animals from sponges with scissors.

Source: "South Dakota-Science Guide for Elementary Teachers"

Activity# 5

CONCEPT:

Animal Life - Primitive Sea Animals

SUBCONCEPT:

The Coelenterate has a simple digestive system.

MATERIALS REQUIRED:

1. Coral
2. Magnifying glass
3. Live sea anemone (a beach location would be an ideal place to do this activity)
4. Small crab

PRE-TRAINING AND BACKGROUND INFORMATION:

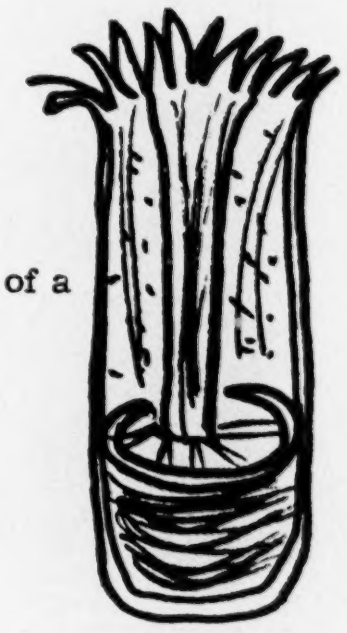
1. The term "Coelenterate" means hollow-gut.
2. All Coelenterates have a mouth and a short, tube-like gullet.
3. Food is taken in and wastes released through the mouth.

ACTIVITY:

1. Locate a sea anemone on the side of a rock or in a tide pool.
2. Drop a small crab onto it. (The tentacles will grasp the crab and stuff it into its mouth.)
3. Observe the sea anemone. (It will later spit out the shell.)

FOLLOW-UP:

1. See the filmstrip FS 974, "Coral Reef". Observe how the corals eat.
2. Disect a sea anemone. Observe hollow gullet.



Cut Away
Showing insides of a sea anemone

Activity # 6

CONCEPT:

Animal Life

SUBCONCEPT:

Worms have soft bodies and no dkeletons.

MATERIALS REQUIRED:

1. Flat, round, and segmented worms
2. Strips cut from construction paper, pieces of yarn, and strips marked into segments (cards with names of each type)
3. Flannel board - magnifying glass

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Worms are longer than they are wide; they have soft bodies and no skeletons.
2. Worms are grouped according to body structure; flat, round, and segmented.
3. A ribbon worm is an example of a flatworm and a clam worm is an example of a segmented worm.

ACTIVITY:

1. Put flat shapes, strings, and segmented strips on the flannel board.
2. Have children come up and group the objects into three different groups; give each a name.
3. Show worms and let children examine them with a magnifying glass.
4. Put each worm with one group on the flannel board and name it.
5. Discuss the general characteristics of a worm with the specimens used as examples.

FOLLOW-UP:

1. Classify other objects according to shape.
2. Dissect a round worm and show simplicity of internal structures.
3. If live worms are available, cut a flat worm in half and observe how each part grows into a new worm.

Activity# 7

CONCEPT:

Animal Life - Crustaceans

SUBCONCEPT:

Crustaceans are a class of the phylum Anthropoda.

MATERIALS REQUIRED:

1. A crab, shrimp (or prawn), lobster, beach fleas, and barnacles, (alive if possible) if not, pictures or slides.
2. Magnifying glass or lenses, microscope (optional)

PRE-TRAINING AND BACKGROUND INFORMATION:

Anthropods have: bodies in three segments (head, thorax, abdomen)
four or more pairs of jointed legs
chitinous exoskeletons covering all body parts

Crustaceans have: two pairs of antennae, one pair of jaws, breathe mostly by gills

Barnacles (in infancy) resemble sand fleas very closely; later in life, they attach themselves to rocks, posts, or boats and lose their eyes, legs and other Crustacean features.

ACTIVITY:

1. Tell children that all the animals they will see are put in the same family.
2. Have children examine the specimens carefully and tell in what way they are the same; you may need to supply more information on the barnacles.
3. List similarities on the blackboard or on a chart.

FOLLOW-UP:

1. Cook and eat the edible Crustaceans
2. Report on barnacles and how they sometimes need to be removed from ships
3. Display the Traveling Study Collection, "Barnacles and Crabs".
4. Show film MP 307, "Life Story of a Crayfish".
5. Read Pagoo by Clancy Holling - the life story of a hermit crab; it has magnificent illustrations.

Source: General Zoology

Activity # 8

CONCEPT:

Animal Life - Crustaceans

SUBCONCEPT:

Crabs are Crustaceans covered with hard shells and having jointed legs.

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Crabs can be recognized by the flat, nearly circular, bodies with the head and thorax fused and portected by a hard shell.
2. All crabs have five pairs of walking legs, each terminating in a claw; the first pair of legs is very large and is used as hands in seizing food.
3. Each kind of crab can be identified by the shape of its shell and the nature of the walking legs.
4. A crab has a pair of jaws and other mouth parts which assist in holding and chewing the food.

ACTIVITY:

1. Children will observe and examine such crabs as the Horse Crab, Shore Crab, and Hermit Crab.
2. Discuss as a group: what a crab generally looks like, how a crab gets his food, the movement of a crab ("crab walk"), what man does with the crabs he captures and the different body parts of the crab.
3. Children will draw a crab of their choice, cut it out, and paste it on colored paper.
   Older children may label the parts of the crab that they have learned.

FOLLOW-UP:

1. Obtain the Crab and Barnacle Traveling Collection for display in the classroom.
2. In creative writing, encourage the class to write a story about a crab; such as "Herman the Hermit".
3. Individual reports on the specific types of crabs may be done for oral presentation.
4. Discuss, demonstrate, and practice the "Crab Walk" as a Physical Education activity.

Source: Background Information - Seashore Parade

Activity # 9

CONCEPT:

Animal Life - Echinoderms

SUBCONCEPT:

Starfish have powerful rays with which they pry apart and eat many other animals.

MATERIALS REQUIRED:

1. Starfish - preserved specimens
   life specimens (can be kept 24 hours in salt water)
2. Magnifying glasses

PRE-TRAINING AND BACKGROUND INFORMATION:

1. The symmetrical body of a starfish consists of a center dish from which radiate a number of rays - "arms" - usually five or six.
2. The upper side of a starfish is covered with a hard substance; on this covering are spines which work like scissors.
3. The starfish breathes through this hard covering.
4. On the underside, are hundreds of tiny feet arranged in rows.
5. The starfish surrounds his food and uses his arms to pull the food in the mouth and then into its stomach.
6. Starfish have the ability to regrow missing rays.

ACTIVITY:

1. Display the different specimens of a starfish for the children to examine. Discuss: why it is called a starfish, where it lives, what and how it eats, and the characteristics of the structure of the starfish.
2. If the live starfish is hungry, it might eat an oyster in captivity. Allow children to observe its predatory nature; how does a starfish attack the oyster?

FOLLOW-UP:

1. For Art, make underwater pictures of a starfish.
2. Have children write or dictate stories about the life of a starfish.
3. Show film MP L-135, "Life Story of the Sea Star".
4. Show filmstrip FS 1318, "Sea Star and Related Spiny-Skinned Animals".

Source: Background Information - Concepts in Science Book #2

Activity # 10

CONCEPT:

Animal Life - Echinoderms

SUBCONCEPT:

The sea urchin is protected by the spines that cover his entire body.

MATERIALS REQUIRED:

1. Specimen of sea urchin and starfish
2. Book - Let's go to the Seashore

PRE-TRAINING AND BACKGROUND INFORMATION:

1. The skeleton of the sea urchin is made up of tiny plates with spines; plates join to form a firm body shaped like a biscuit. Between the spines, there are tube feet.
2. The body is made up of five parts like the starfish, only the parts are hooked together to form a solid shell.
3. The sea urchin uses its tube feet to move and cling to objects; it uses its spines to walk, as well as to protect itself.
4. Sea urchins can be found in tidepools or in and around rocks when the tide is out.

ACTIVITY:

1. Display the specimen of the sea urchin to the class. What can you find out about the body structure of the sea urchin? Discuss with the class the location of the mouth, the value of the spines on the body of the sea urchin and where they might find this animal on the beach.
2. Show pictures of the sea urchin's teeth from the book, Let's Go to the Seashore.
3. Compare the sea urchin and the starfish, using the specimens; examine the body structure of both animals.

FOLLOW-UP:

1. For Art, use colored tooth-picks to reconstruct the shape of a sea urchin; this can be used as a mobile or on a bulletin board.
2. Obtain and display the Starfish-Sea Urchin Traveling Study Collection.

Source: Let's Go to the Seashore

Activity # 11

CONCEPT:

Animal Life - Echinoderms

SUBCONCEPT:

The sea cucumber loses his intestines when frightened.

MATERIALS REQUIRED:

1. Preserved and live specimen of a sea cucumber
2. Pictures of sea cucumber in his natural environment
3. Magnifying glasses

PRE-TRAINING AND BACKGROUND INFORMATION:

1. The sea cucumber is a long and slender animal with a tough skin.
2. In place of having tube feet in grooves on the five rays as in the starfish, the sea cucumber has five irregular rows of tube feet running the length of the body.
3. By controlling the amount of water in the body, the sea cucumber changes his shape often.
4. If a sea cucumber is attacked when his body is filled with water, the sudden pressure causes him to lose his intestines; he can, however, grow new ones easily.
5. The sea cucumber has its mouth at the front end; he uses feelers to gather food.

ACTIVITY:

1. Class may examine the sea cucumber, in salt water as well as out of the water. Allow them to handle the specimen, notice how small he gets. If frightened, the sea cucumber may lose his intestines.
2. Discuss: Why he is called a sea cucumber, why he is able to change his size, and the characteristics of his body structure.
3. Have class review and compare the characteristics of the starfish, sea urchins and the sea cucumber.

FOLLOW-UP:

1. Have children make a drawing of the sea cucumber; note that this sea animal may be reddish-brown, black, white, or sand-colored.
2. Discuss the term "regeneration"; the sea cucumber can grow itself a whole new set of internal organs.

Source: Background Information - Sea and Shore

Activity # 12

CONCEPT:

Animal Life - Echinoderms

SUBCONCEPT:

Sand dollars derive their name from their unique shape.

MATERIALS REQUIRED:

1. Live sand dollars (if possible)
2. Preserved sand dollars

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Sand dollars have five parts to their shells.
2. They have many hair-like spines which are their legs.
3. When a sand dollar is dead, the spines have fallen off and their shells are white or sand colored. Live sand dollars are colored purplish gray.
4. Sand dollars cannot live out of water--they like to be on top of the sand or hide under the sand, but they are always under water.
5. The flower-shaped design on the sand dollar is made up of tiny holes through which tube feet protrude; the tube feet are used for breathing.

ACTIVITY:

1. Let children work in groups of four; have them observe the sand dollars for structure, size, and color. Have them locate the mouth, spines, and tube feet. Older children may write down their observations to share with the class.
2. As a class, let the different groups discuss what they have discovered; encourage the answering of questions solely by the children.
3. Discuss: Where the sand dollar gets its name, how a live and a dead sand dollar are different and alike, and where a sand dollar is found on the beach.

FOLLOW-UP:

1. Paint sand dollars that have been found on the beach; use them on a bulletin board or paste on colored paper, making a design with them.
2. Compare characteristics of the sand dollar and the sea urchin--using specimens for comparison.
3. Disect several sand dollars; examine the size of each and internal structure.

Source: Background Information - Let's Go to the Seashore

Activity # 13

CONCEPT:

Animal Life - Mollusks

SUBCONCONDEPT:

Seashells were once the home of mollusks. (Making a shell collection)

MATERIALS REQUIRED:

1. Shells
2. Boiling water
3. Knife
4. Tweezers
5. 3 x 5 note cards
6. Cloth
7. Mineral oil
8. Clorox

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Shells are beautiful, fun to find, and easy to mount and keep.
2. Empty shells are ready to collect.
3. Living mollusks must be killed, as they will die , leaving your shell with an odor.

ACTIVITY:

1. From a beach, collect desired shells; label empty shells with the name of the shell and place and date it was found.
2. Place living mollusks in boiling water for 3-10 minutes; bivalves should be boiled until halves of shell open; univalves take about 4 minutes.
3. Scrape bodies from bivalves. Remove bodies of univalves with tweezers. (If shell is small or fragil, soak it in 50% alcohol for 24 hours.)
4. Clean outside of shells by scraping them with a dull knife and soaking them in water and clorox for about two hours. Then rub them with a rag dampened in oil. This restores luster and preserves them. NEVER label as in step #1.

FOLLOW-UP:

1. Display shell collection.
2. Using references, identify and name your shells.

Source: Let's Read About Sea Shells

Activity # 14

CONCEPT:

Animal Life - Mollusks

SUBCONCEPT:

Bivalve shells consist of two parts held together by a strong adductor muscle and a hinge on one side; the oyster is an example.

MATERIALS REQUIRED:

1. Canned and fresh oysters
2. Magnifying glasses

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Oysters are mollusks with bivalve shells.
2. Oyster shells are rough on lthe outside and take on stranger shapes because they grow on top of one another.
3. The lower valve of the shell is deep and the animal lives in it, while the rounded upper part covers the animal.
4. Oysters are hatched from an egg. At the end of a short swimming period, the young oysters settle down on rocks near shore and eat the tiny plants and animals. They take in food and water through a tube.

ACTIVITY:

1. Display different examples of oysters and oyster parts for the children to examine with the magnifying glasses. Encourage the children to discover the characteristics of the oyster from the specimens.
2. Conduct a Question and Answer Period:
   What kind of animal have you been examining?
   What covers its body?
   Is the shell in one part or two parts?
   What can an oyster do with its bivalve shell?
   Where does the oyster live?
   What might an oyster eat?

FOLLOW-UP:

1. Discuss the oyster's value to man. (food, jewelry, pearls)
2. Discuss the oyster's plight from enemies. (lives on ocean floor; is stationary and cannot escape from enemies--man and starfish)
3. Make a diagram of the oyster and label it.
4. Show film MP L-142, "Life Story of the Oyster".

Source: Seashore Parade and Concepts in Science, Book #2

Activity # 15

CONCEPT:

Animal Life - Mollusks

SUBCONCEPT:

Clams, oyster, and mussels are bivalves because their shells consist of two parts.

MATERIALS REQUIRED:

1. Live clams, mussels and oysters.
2. Disecting instruments

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Bivalves are shells with tow valves or halves, that are held together by hinges.
2. At the inside of a bivalve shell, there are one or two scars which mark the places where the muscles (called adductors) that close the shell were attached.
3. A bivalve has two main portions in its body; the siphons and the foot.
4. Through siphons, the bivalve secures all the food and oxygen it needs and eliminates waste products.
5. The foot enables the bivalve to move through sand and mud.

ACTIVITY:

1. Allow class to examine the three examples of bivalves; introduce the new term. Discuss how the specimens are alike and different; observe the outside shell covering. Discuss locomotion of these animals, and their eating habits.
2. With disecting instruments, open clams, mussels and oysters by cutting the hinge. Boiling them first, will ease the process of disection. Examine the internal parts; older children may wish to find out the name of each part and label what they see on a drawing.

FOLLOW-UP:

1. Children may bring examples of bivalves they have found on the beach to share with the class.
2. In Creative Dramatics, create an imaginary clam hunt.
3. Obtain and display local shells from the Traveling Collection available from the University of Washington.

Source: Sea and Shore

Activity # 16

CONCEPT:

Animal Life - Mollusks

SUBCONCEPT:

Mollusks are animals whose soft bodies are encased in shells.

MATERIALS REQUIRED:

1. Bivalve shells - razor clam, oyster
2. Univalve shells - snail, limpets

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Bivalve (clams and oysters) shells consist of two parts held together by a strong adductor muscle and a hing on one side.
2. Univalves (snails and limpets) have one shell; when frightened, they pull their entire body into their shell and close it off with an operculum (trap door).

ACTIVITY:

1. Set up work groups with four children in each. Give them a group of shells, both bivalves and univalves.
2. Give them a simple list of questions, to be answered in group work.
   Some sample questions for this list might be the following:
   Name the shells that you recognize.
   How are the shells alike? different? Why?
   What type of animal might use each shell for its home?
   How does man use shells?
   What are shells made of? (Activity #18)
3. Bring class together; compare findings. Introduce terms: bivalve, univalve, if necessary.

FOLLOW-UP:

1. Let children classify shells according to new terms; bivalve and univalve.
2. Have children draw an example of a bivalve and a univalve.
3. Display the Traveling Study Collection, "Tropical Shells".

Activity # 17

CONCEPT:

Animal Life - Mollusks

SUBCONCEPT:

Univalves have one shell; the snail is an example of a univalve.

MATERIALS REQUIRED:

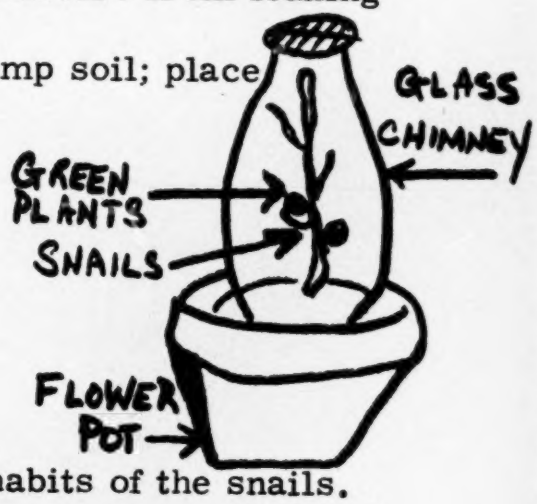
1. Snails
2. Green Plant
3. Flower pot and clay saucer
4. Small piece of screening wire
5. Damp soil
6. Glass chimney

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Snails have heads, tentacles, eyes and move about by gliding on their muscular feet.
2. Snails spend endless hours searching for food; some eat seaweed and others eat animals.
3. To obtain food, the snail has a tongue-like organ called a radula, which is sharp as a saw.
4. The ordinary snail shell is shaped like a "top" and the animal within is twisted and twined until his insides are all out of place.

ACTIVITY:

1. Fill a clay flower pot with damp soil.
2. Plant a 6" garden plant in the soil and cover the plant with an old-fashioned glass lamp chimney.
3. Place a small piece of screen at the top of the chimney and a saucer under the flower pot to prevent the moisture from leaking out.
4. Place the snails under the chimney on the damp soil; place terrarium in a dimly lit part of the room.



FOLLOW-UP:

1. Children are to observe the appearance and habits of the snails.
2. Observations may be recorded on data sheets.
3. Observations: see how the snails protect themselves when disturbed, see how destructive the snail can be to plant life.

2. Reports on specific types of snails may be made by individual pupils.
3. Show film MP 308, "Life Story of a Snail".

Source: Science Activities: for Elementary Children

Activity # 18

CONCEPT:

Animal Life - Mollusks

SUBCONCEPT:

Some mollusks make their hard shells out of lime, dissolved in water.

MATERIALS REQUIRED:

1. Glasses
2. Lime
3. Water
4. Straws
5. Clam shells

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Some sea animals make their hard shells out of lime dissolved in water. The animals have CO_2 in their body and when they take in sea water, which contains lime, shells can be built.
2. Another way shells are made is through the mollusks mantle. The mantle has many tiny tubes that secrete bits of calcium mineral, which the mantle takes from the water.

ACTIVITY:

1. Give each child a straw and have them work in partners. Each set of partners is given a glass with lime water. Conduct a question and answer period; as questions are asked, the children find the answer through experimentation.
2. Questions: What does the limewater in your glass look like?
   Does anything happen when you blow into the water with the straw?
   What happens if you keep blowing? (limewater becomes milky).
   What happens when you stop blowing? (tiny white grains go to the bottom).
3. Pour off the water; let tiny grains dry off. (limestone is made of tiny grains like these.)

FOLLOW-UP:

1. Compare grains of limestone with the example of the clam shell.
2. Compare other type of shells with the limestone.
3. Discuss how the mollusk is able to make his shell; look at a drawing of a cross section of a shell and the mantle of a clam.

Source: Science on the Shores and Banks

Activity # 19

CONCEPT:

Animal Life - Mollusks

SUBCONCEPT:

Squid and octopuses move by jet propulsion.

MATERIALS REQUIRED:

1. Balloon

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Squids and octopuses take in water and shoot it out through a siphon under their necks,
2. They are able to direct this stream of water and move themselves about, in any direction they want to go.
3. Squids and octopuses are called "head-footed" because their heads and jaws are right behind their arms, which are also their legs and feet.
4. When danger threatens, they squirt out a cloudy fluid which hides them.

ACTIVITY:

1. Discuss with the children the idea of a shooting stream of water, such as a hose in a pool which has been turned on full force and it shoots itself out of the pool; or the action of a fire hose which has a tremendous amount of water being forced through it.
2. Blow up a balloon and let go of it--what happens?
3. Relate this concept to the movement of squids and octopuses; stress the idea that these animals use water in their movements, and they are able to control their direction.

FOLLOW-UP:

1. Discuss other characteristics of squids and octopuses--see Children's Booklet.
2. Compare them to other mollusks that have been studied.

Source: Illustrated Book of the Sea - Background Information

Activity # 20

CONCEPT:

Animal Life - Vertebrates

SUBCONCEPT:

Fish use their gills in the process of breathing.

MATERIALS REQUIRED:

1. Live fish and some of the water its been in
2. Food coloring
3. Eye dropper
4. A white bowl

PRE-TRAINING AND BACKGROUND INFORMATION:

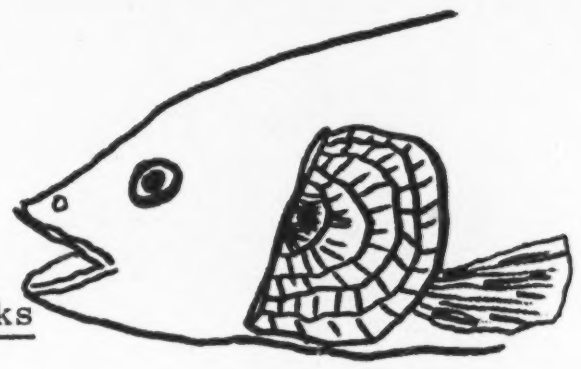
1. Fish take in water containing oxygen through their mouths. This water passes out through the gills, which remove the oxygen from it.
2. Carbon dioxide is taken from the blood stream and passed out into the water by the gills.

ACTIVITY:

1. Put a fish and some of its water into a white bowl.
2. Observe the fish. As it opens its mouth to take in water, put one drop of food coloring in the water right over the mouth.
3. When color is taken into the fishes mouth, watch for it to come out from under the gill covers.

FOLLOW-UP:

1. Watch fish in water and notice how the gill covers move.
2. Compare the function of gills to that of the lungs.
3. Remove the gill covers from a dead fish and examine the gills.



Source: Science on the Shores and Banks

Activity # 21

CONCEPT:

Animal Life - Vertebrates

SUBCONCEPT:

There are more than 14,000 different species of fish.
"Making plaster fish casts"

MATERIALS REQUIRED:

1. Oil-base (non-drying) clay
2. Plaster of paris
3. Cardboard boxes (shoe boxes
4. Plastic spray
5. Water color paints (or chalk, pastels, or crayons)
6. Frozen fish

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Using this method, you can literally "have your fish and eat it too".
2. Teacher may wish to demonstrate this technique, and encourage the children to try it at home.
3. After demonstration, children could bring in frozen specimens from home to try this in class.

ACTIVITY:

1. Catch and freeze a small fish.
2. Line a box that will hold the fish with clay about half as deep as the fish is thick.
3. Press the frozen fish into the soft clay. Remove the fish and you will have a clay mold of it.
4. Mix plaster and pour into the box, filling the fish imprint.
5. Continue pouring until plaster is thick all around the fish model.
6. When plaster hardens, remove sides of box and lift out the cast.
7. Remove clay. Remove any bulles or irregularities with a knife or sharp stick.
8. Paint the fish to resemble the specimen; scratch on the place and date when the fish was caught.

FOLLOW-UP:

1. Display fish casts - on bulletin board or science table.
2. Observe coloring any try to determine where the fish might have lived.
3. Make casts of other sea animals.

Source: Science on the Shores and Banks

Activity # 22

CONCEPT:

Animal Life - Vertebrates

SUBCONCEPT:

Birds living near the sea are well adapted for gathering food from their environment.

MATERIALS REQUIRED:

1. Traveling Study Collection - "Birds" or Pictures of Sea Birds
2. Traveling Study Collection - "Beaks and Claws"
3. Pictures of gulls and other sea bird's nests

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Sea birds' beaks and feet are specially adapted for fishing, wading, and swimming.
2. Sea birds use materials found on the beach in their nests.

ACTIVITY:

1. Observe the feet of sea birds - compare to perching foot of robin, scratching foot of chicken, and talons of hawk.
2. Discuss how webbing between toes helps the birds to swim; compare with frog's feet and rubber swim fins.
3. Compare the beaks of the fish eaters with those of seed and insect eaters. Note scooped, sharp bills for catching fish.
4. Look at nests and discover what they are made of.

FOLLOW-UP:

1. See film MP 236, "Birds and their Characteristics"
2. Report on common sea birds
3. Third graders may wish to read "The Sandpiper", found in the Roberts English series.

Source: Seashores

Activity # 23

CONCEPT:

Animal Life - Vertebrates

SUBCONCEPT:

Mammals breathe with lungs although they have adapted other breathing habits for a sea life.

MATERIALS REQUIRED:

1. Pictures - Mammals of the Sea (whales, sea otter, seals, dolphins, walruses)
2. Book, Baby Whale Sharp Ears, by John Beaty

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Mammals of the sea have developed the ability to hold their breath underwater for a long time; some have developed nostrils which can be closed to keep water out and others have developed the ability to take in large amounts of air before diving.
2. Over the years, sea mammals have also changed their body shapes to adapt themselves to their environment.
3. Over the years, their limbs turned into flippers (example--seals).
4. Some of the sea mammals lost their outer ears; making themselves more streamlined.

ACTIVITY:

1. Display pictures of sea mammals.
2. Discuss the different characteristics of a mammal.
3. Compare sea mammals with land mammals. How has each sea type suited his body structure to a life in the sea? What would sea mammals eat?
4. Discuss the dangers that face sea mammals; discuss whale hunting as a source of oil and food. Should this be allowed?
5. Read the story, Baby Whale Sharp Ears, by John Beaty.

FOLLOW-UP:

1. Children may be assigned to make individual reports on a specific sea mammal.
2. Children may bring in pictures of sea mammals to be put into a large room collection.
3. Individual reports on whale hunting or the performing sea animals (dolphins) can be done for oral presentation.
4. In Art, using newspaper, wire, paper mache', let children create their favorite sea mammal. Build the body structure with wire, cover with newspaper strips of paper mache', let dry, and then paint. Characteristics such as fur can be added features.

Source:

The Sea -

Life Nature Library

Activity # 24

CONCEPT:

Animal Life - Vertebrates

SUBCONCEPT:

Reptiles that live in the sea also breathe with lungs as man does.

MATERIALS REQUIRED:

1. Live turtles (5)
2. Magnifying glasses
3. Picture of sea turtle
4. Chart--Headings: skin, breathing, feet, ears, eggs (Characteristics of Reptiles)

PRE-TRAINING AND BACKGROUND INFORMATION:

1. Turtles are distinctive reptiles because of their bony shells. Millions of years ago, while dinosaurs still roamed the earth, turtles developed this strange protection.
2. Turtles are cold blooded and they have lungs; turtles have no teeth and their eyesight is excellent.
3. Their feet, head, and tail are usually scaly. Turtles have a hearing apparatus, but it may not show externally.
4. Sea turtles have legs modified for swimming. Some of the giant sea turtles move their flippers (modified front legs) up and down in order to fly through the water.

ACTIVITY:

1. Divide class into groups of four. Using chart, discuss the characteristics of reptiles that they can discover by observing and examining the turtles. Allow them time to work as a group.
2. Let class complete the chart together by discussing their findings:
   - Skin - scaly, dry, bony shell (protective covering)
   - Breathing - by lungs
   - Feet - toes have claws
   - Ears - small, curcular membrane
   - Eggs - lay in sand, loose soil
3. Through discussion, relate these findings to the characteristics of sea turtles. Use picture for illustration.

FOLLOW-UP:

1. Let the class organize a turtle race. Objective: do all turtles travel at the same speed?
2. Individual reports on the sea turtle can be assigned for oral presentation.
3. In Art, make moveable turtles from construction paper:
   - Cut a circle (see A) with pie shape cut out, from white construction paper.
   - Cut the different parts of the turtle from paper also. For smaller children, a ditto can be used when cutting the shapes.
   - Paint the different turtle parts with poster paints.